OPERATION AND MAINTENANCE

OF

MECHANICAL FIELD WARD REFRIGERATOR

NSN 4110-01-291-7046

MARVEL MODEL

#4570105 - MODIFIED - 230/115 VOLT, 60/50 Hz.

CONTRACT #DLA-120-89-C-8509

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CHAPTER 1

INTRODUCTION

1-1. INTRODUCTION.

1-2. This Operation and Maintenance Manual gives you the information necessary for using and maintaining the Mechanical and Biological Refrigerator, NSN 4110-01-180-3420. The manual includes information for operation, preventive maintenance, and corrective maintenance.

WARNING

WHEN THE REFRIGERANT LINE HAS BEEN OPENED, OR FOR ANY OPERATION REQUIRING OPENING THE REFRIGERANT LINE ONLY QUALIFIED MAINTENANCE PERSONNEL, USING PROCEDURES AND EQUIPMENT SPECIFIED BY THE MANUFACTURER OR BY DEPOT-LEVEL AUTHORITIES, SHOULD WORK ON THE REFRIGERATION SYSTEM.

ANY MOISTURE THAT IS ALLOWED INTO THE REFRIGERATION LINES WILL COMBINE WITH THE FLUORINE AND CHLORINE REFRIGERANT TO PRODUCE HYDROCHLORIC ACID, AN EXTREMELY POWERFUL AND CORROSIVE ACID.

1-3. All procedures in this manual refer to the electrical and mechanical elements of operation and maintenance.

1-4. **Organization of the Manual.** As shown in the Table of Contents, this manual is organized as follows:

Chapter 1: INTRODUCTION. Provides information on Organization of the manual, purpose of the refrigerator, description and specifications for the refrigerator, list of required equipment, and safety information.

Chapter 2: OPERATION. Tells you how to unpack, install, and operate the refrigerator, with a brief theory of operation.

Chapter 3: MAINTENANCE. Details the procedures for preventive and corrective maintenance of the refrigerator.

Chapter 4: PARTS LIST. Lists, by assemblies, the replacement parts for the refrigerator, with part numbers and illustrations.

Chapter 5: DIAGRAMS. Contains all illustrations cited in the text but not otherwise included.

1-5. **Purpose of the Refrigerator.** The refrigerator is to be used as a refrigerator-freezer at ward level in field hospitals as designated by the Department of Defense.

1-6. **Description.** Refer to fig. 1-1 and 1-2. The refrigerator is light weight and portable, designed for field operations. Providing 4.5 cubic feet of refrigeration and freezing space, the refrigerator incorporates three shelves, drip pan, a 0.7 cubic-foot freezer compartment, adjustable thermostat, carrying handles, glide-feet, and corrosion-resisting steel shield for mounting over rear mechanism openings. The refrigerator compartment operates over a temperature range of 34 to 42 degrees Fahrenheit, and the freezer compartment operates over a range of 12 to 20 degrees Fahrenheit. The refrigerator has a 220/110 VAC step-down transformer; it can operate from either a 220 or 110 VAC, 60/50 Hz source. Fig. 1-2, No. 1, 2, 3.

1-7. The outer shell of the refrigerator is 1/32nd inch carbon steel with olive drab finish. The inner shell and door liner are plastic. The door is trimmed with anodized aluminum and has a magnetic latch. There is an additional door - security snap fastener located at the upper left corner for use during transport.

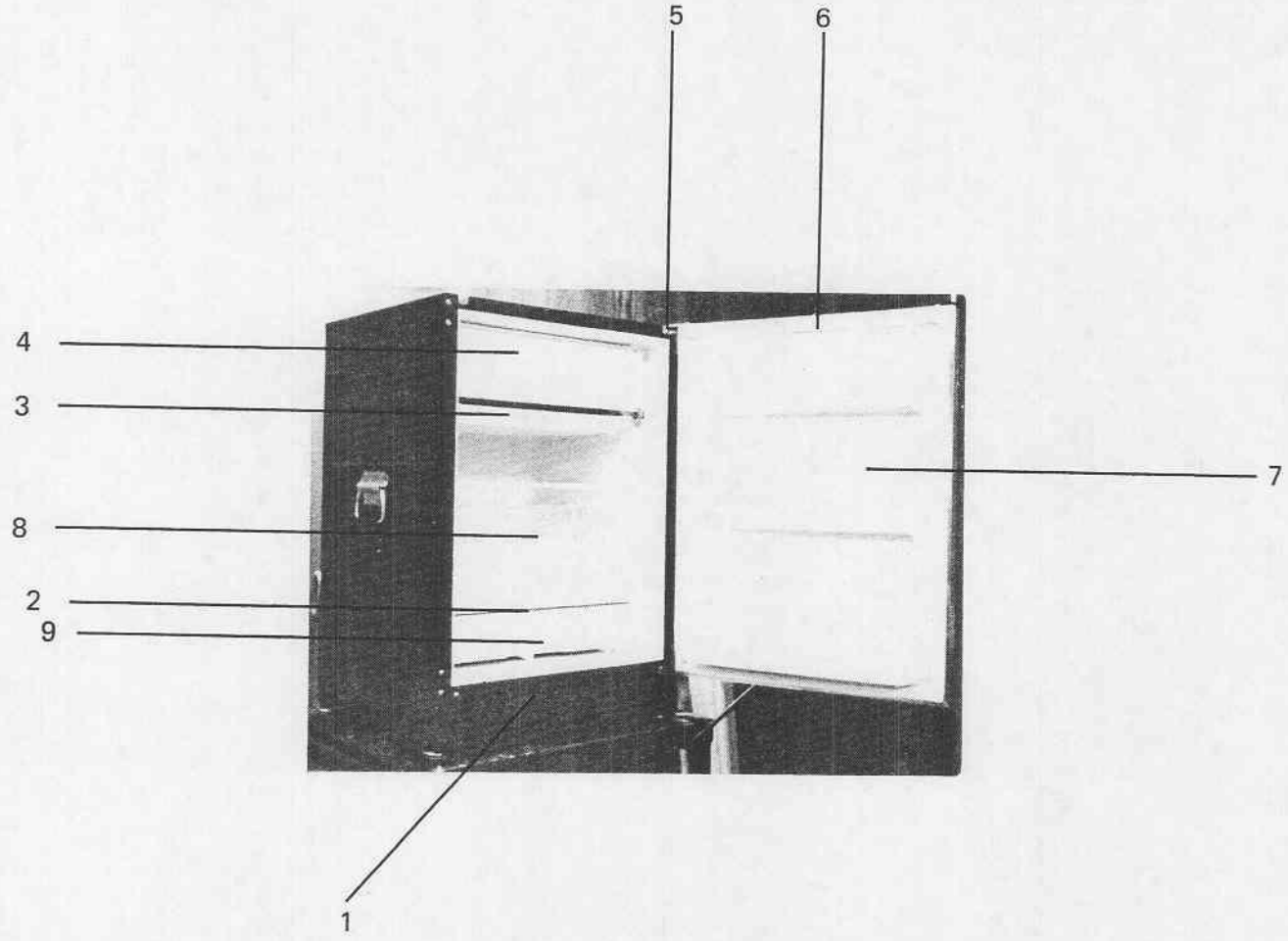

Fig. 1-1. Refrigerator, Front View

1. Thermostat (behind grill)
2. Crisper shelf
3. Drip tray
4. Freezer door
5. Hinge pin
6. Door gasket
7. Door
8. Wire shelf
9. Crisper tray
10. Cabinet assembly

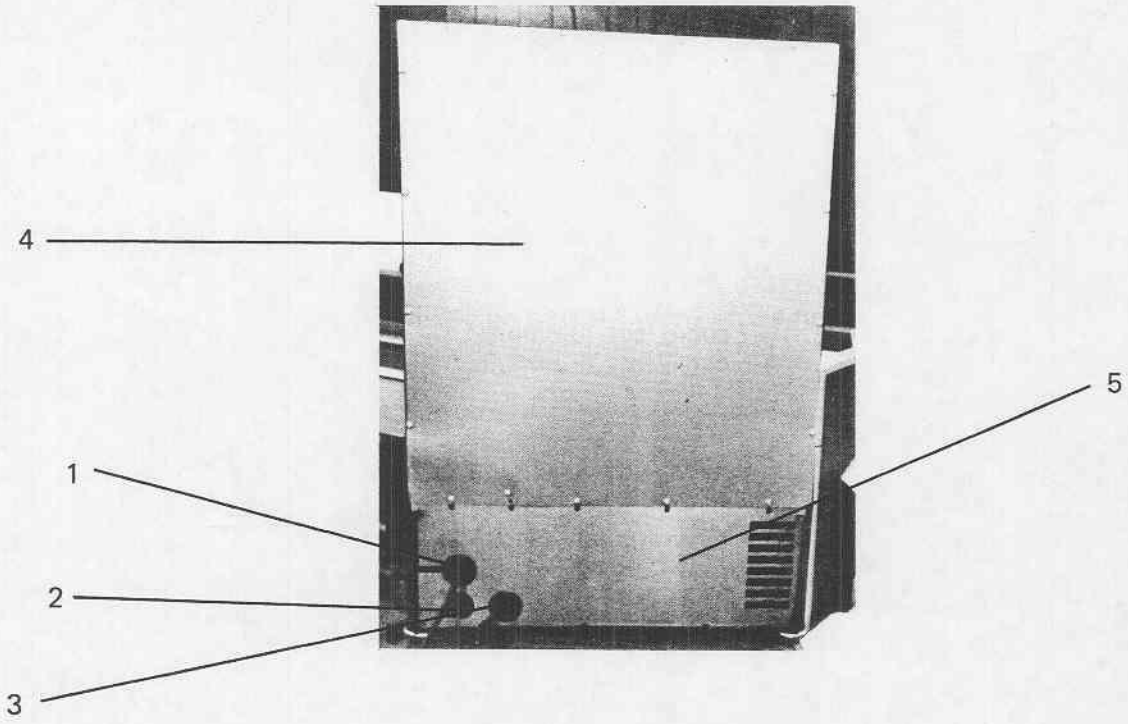

Fig. 1-2. Refrigerator, Rear View

1. Transformer 220 Volt line
2. Transformer 120 Volt outlet
3. 120 Volt power cord
4. Cabinet back cover
5. Stainless steel backshield (for mechanical assembly)

1-8. **Specifications.** Table 1-1 lists the complete specifications and parameters for the refrigerator, NSN 4110-01-291-7046.

Table 1-1

Parameter	Specification
Acceptable input voltages	110/220 VAC. Step-down transformer provided for use with 220 V AC source.
Acceptable input frequencies	60/50 Hz.
Power consumption	240 watts nominal; 1650 watts maximum surge
Line current maximum	15 amps inrush at 110 V; 7.5 amps inrush 220 V
Weight	106 lbs.
Volume, internal	6.1 cubic feet
Outer dimensions	35 1/4" H x 25 3/8" W x 24 1/16" D
Internal volume	
Freezer	0.7 cubic feet, minimum
Refrigerator	4.5 cubic feet, minimum
Pull-down times at ambient temperature of	
120 degrees F:	3.0 hours
100 degrees F.	1¼ hour
77 degrees F.	½ hour
Nominal weight and volume in shipping container	
Weight	135 lbs.
Volume	16.8 cubic feet
Dimensions	38½" H x 28" W x 27" D
Type of refrigerant	R-12
Weight of full charge of refrigerant	4.7 oz. (0.29 lbs.)

1-9. **Required Tools.** Table 1-2 lists all of the tools required for normal use and maintenance of the refrigerator.

Table 1-2

Description	No. Req'd
Phillips head screwdriver (3"-4" long)	1
Phillips head screwdriver (8" long)	1
Flatblade screwdriver (small, approximately 1/8" - wide blade)	1
Hand roller	1
36" x 36" Cardboard sheet	1
36" x 36" Table or bench	1
Channel-lock adjustable pliers	1
Combination open end/box end wrenches	1
Any standard multimeter for checking voltages and continuity of circuits	1

For tools and associated equipment used in maintenance procedures NOT described in this manual, refer to Depot-level maintenance organization or contact the manufacturer: Marvel Industries, P.O. Box 997, Richmond, Indiana 47375.

1-10. **Safety.** **ALWAYS** observe the warning notice shown after paragraph 1-2, above. Additionally, be careful of power sources. **110 volts can kill you.** If your system uses 220 volts with a step-down transformer, being very careful is even more important. For connection to a 220 VAC source, be sure to use the step-down transformer, as detailed in par. 2.4f, below.

1-11. When the refrigerator is in operation, the condenser (radiator) can get hot enough to burn your skin.

1-12. **NEVER** use a two-wire cord or power outlet with this refrigerator. Such a practice can produce shocks and will damage operating elements of the system.

CHAPTER 2

OPERATION

2-1. INTRODUCTION.

2-2. This chapter details unpacking, installation, and operation of the refrigerator, with a brief explanation of the theory of operation.

2-3. **Unpacking.** Unpacking is easy. The refrigerator is shipped in a heavy-duty cardboard carton, with slip-off top and bottom covers held on by steel straps. To unpack:

a. Stand the carton upright.
b. With tin snips, cut the lower steel band.
c. Pull all four sides of the bottom cover away and down from the sides of the carton.
d. Lifting from the top, pull the carton up and off of the refrigerator.
e. Dispose of the carton, dust off the refrigerator, and it is ready for installation.

2-4. **Installation.** Getting the refrigerator ready to operate is very simple. Dispose of the packing material, and position the refrigerator where you want it. Then:

a. Be sure that the cord provided is long enough to reach a safely grounded three-prong outlet. Connect the plug to the wall socket at the end of this installation procedure. For a wall outlet that is 220 VAC, the wall socket cord must go to the transformer, located at the back lower left corner, shown in fig. 3-1. Then plug the output line of the transformer to the input line of the refrigerator, shown in fig. 1-2.

b. The four glides (feet) of the refrigerator are non-adjustable. If the refrigerator is on a level surface, the refrigerator will be level.

c. At the upper left front corner there is a snap-fastened safety strap which holds the door closed during shipment. To open the door, unsnap the safety strap and pull on the handle; the door has a magnetic latch.

d. At the lower left front corner, behind the grill, which is held on by two small screws, you will find the thermostat. The aluminum sensor line attached to the thermostat runs up the back of the refrigerator to the upper right rear corner. The sensor lies between the rear panel and the insulation. The dial of the thermostat has an adjustment range of 1 to 7 (7 is the coldest setting. It is preset at the factory for 3½), providing the normal operating temperature. Varying ambient temperatures may require re-setting the thermostat dial for your installation.

e. Finally, before making the power connection, be sure that the interior of the refrigerator is clean.

f. Connect the power cord to the appropriate source: 110 or 220 volts AC, nominal. For a 220 VAC source, plug the transformer inlet line into the source, then connect the 120 Volt line into the transformer outlet. For 120 VAC source, plug the 120 Volt line directly to the source.

2-5. **Operation and Theory of Operation.** Once prepared as specified above, the refrigerator functions automatically. The following is a brief explanation of how the refrigerator works. This explanation will enable you to operate and maintain the refrigerator most efficiently.

2-6. Refer to fig. 2-1, a functional diagram of the system, and to figs. 4-1, 4-2, 4-3, which show the components and their location in the refrigerator. To follow the explanation, refer to these figures.

a. The thermostat (located behind the grill at the lower left front of the refrigerator) monitors temperatures inside the refrigerator. When the sensor shows a temperature warmer than the adjusted setting, the thermostat's contacts close, completing the circuit that operates the compressor. The compressor takes in the warm low pressure gas and converts it to high pressure gas. Passing through the condenser (radiator), the chlorine/fluorine refrigerant gives off heat to the air surrounding the condenser, primarily through the cooling fins, like any radiator. During this process the high pressure gas changes state as it loses heat, coming out of the condenser as a high pressure liquid. The dryer/filter blocks particles, and contains a desiccant to remove any water from the system. Water is a hazard because it can combine with chlorine/fluorine refrigerant to form hydrochloric acid, a powerful, toxic substance.

b. From the output side of the Filter/Dryer, the high pressure liquid flows through the evaporator, which in fact is incorporated into the walls of the freezer compartment of the refrigerator. In this process, the refrigerant lowers temperatures by absorbing heat from the interior of the refrigerator, changing in the process to low pressure liquid, then to a low pressure gas.

c. On fig. 2-1, look at the PTC Starter Relay. This relay performs two important functions: It brings both the thermostat and the condenser fan motor into the compressor-start circuit, and it provides the required sequence for bringing the compressor to full power. When the thermostat closes, the circuit between the 120 V power cord high (black) line and the P8 of the PTC starter relay, the first surge of power goes through the relay to the start-up windings in the compressor. A pre-set time later, the voltage is switched to the compressor-run windings. Also, the relay completes the circuit through P2 to the condenser fan motor. If the fan does not run, the refrigerator system cannot function. Connections are as indicated in fig. 2-1. Notice that EITHER fan motor line can be connected to either P8 or P2. Looking at the connections you will see that two lines go to each pin, secured by a spade-lug connection covered with shrink-wrap "piggy-back" connectors.

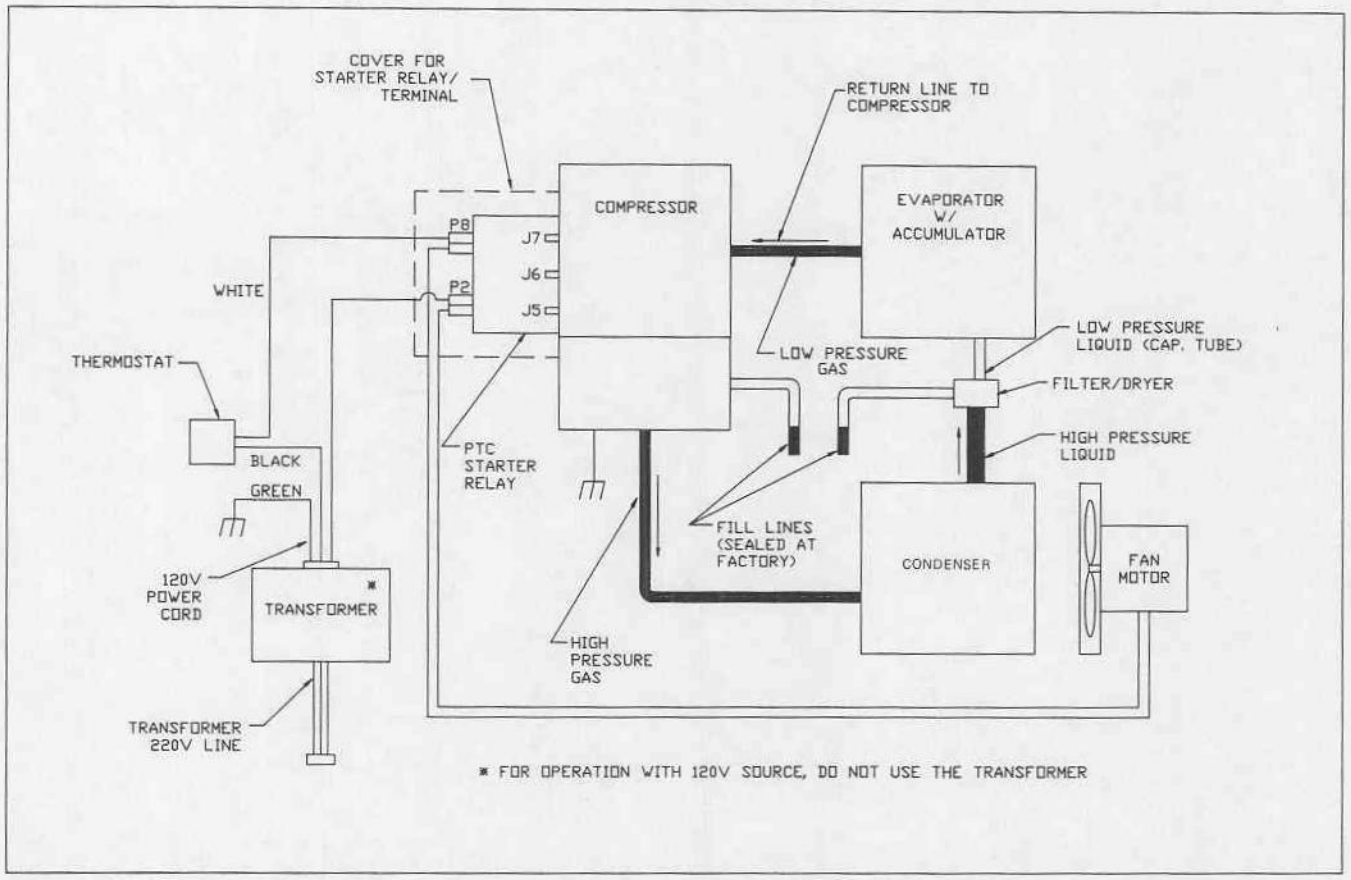

Fig. 2-1. Refrigerator Functional Block Diagram

d. The element marked accumulator is a section of the evaporator that acts as a reservoir, keeping the return line to the compressor filled with low pressure gas.

e. The refrigeration system cannot function with proper operation of the fan.

f. Fig. 2-1 shows a system that uses a 220 Volt source. If your system uses a primary source of 120 Volts, the transformer is not required: simply plug the 120 VAC power cord directly to the source.

g. Notice that the 120 V power cord green line and a short green line from one of the compressor's mounting studs are attached to cabinet ground. See also fig. 3-1, No. 13.

h. Refer to fig. 2-1. It is important to notice that a failure of the PTC starter relay can appear to be a failure of the compressor. When the relay functions as it should in normal operation, closing of the thermostat's relays allows 120 VAC to flow from the black lead of the power cord through the contacts of the thermostat, along the white return lead from the thermostat to relay P8. The relay operates to start the compressor, then switches voltage to the compressor-run windings. The fan motor leads to the P8 and P2 "piggy-backs" start the condenser fan motor. The white lead from the power cord attaches to P2 to complete the circuit. So, a failure of the PTC relay can also look like a problem with the fan motor.

CHAPTER 3

MAINTENANCE

3-1. INTRODUCTION

3-2. This chapter covers preventive maintenance and corrective maintenance, including a recommended schedule of maintenance and a brief trouble shooting guide.

3-3. SAFETY. **In working on this refrigerator, be sure to ALWAYS observe the elements of safety cited in the general introduction, par. 1-2, and at par. 1-9. Before performing any of the following, ALWAYS be sure that the refrigerator is unplugged from its power.**

3-4. **Preventive Maintenance.** The following lists periodic preventive maintenance procedures, to be completed daily, weekly, monthly, and semi-annually to insure continuity of operation and prompt discovery of problems, or potential problems.

DAILY

Check door gasket for proper seal or damage. If damaged, see par. 3-10.

Check cold plate for heavy frost accumulation. Defrost if frost is more than ¼" thick. For defrost procedure, see par. 3-16.

Check that the defrost tray is flush against rear cabinet liner wall. If the defrost tray is damaged, see par. 3-15.

Check freezer door for correct operation, sealing, and closure. If the freezer door is damaged, see par. 3-14.

Check commodities in the freezer and refrigerator sections. If necessary, change the thermostat setting (changes temperatures in both compartments). If the thermostat does not work, see par. 3-11.

WEEKLY

Check the refrigerator for scratches or scrapes on outside painted surfaces. Repair with touch-up paint to prevent rusting. See parts list, Chapter 4.

Check glass shelf/crisper tray for cracks or other damage, replace. See parts list.

MONTHLY

Check the refrigerator door gasket for accumulation of dirt or possible damage. If dirty, wipe clean with a mild detergent. If it is damaged, see par. 3-10.

Check power cord for damage. If it is damaged, see par. 3-8 or 3-9.

Check electrical plugs for damage. In case of damage, see par. 3-8 or 3-9.

Check fan motor/compressor and transformer for correct operation. If there is damage, see par. 3-15.

Check shelves, crisper trays, liner walls, and refrigerator floor for dirt accumulation and damage. Wipe clean with mild detergent. In case of damage, replace shelves and trays (see parts list, Chapter 4). If liner walls or floor are damaged, return refrigerator for depot-level repair/replacement.

SEMI-ANNUALLY

Check the condenser coil, fan assembly, compressor, and transformer for accumulation of dirt/dust. If necessary, clean with vacuum cleaner. For removal of stainless steel backshield to gain access to the mechanical assembly compartment, see par. 3-7c and fig. 1-2.

3-5. **Troubleshooting.** The following section gives you the procedure for troubleshooting to identify the cause of problems that might occur in refrigerator operation. In each case, the symptom is followed by a procedure for eliminating the problem.

120 VOLT (60/50 Hz) POWER GRID SYSTEM

Symptom: **Refrigerator does not cool or operate.**
Remedy: Is the 120V plug in a 120 VAC outlet? If not, plug it in.
Is the circuit breaker for the 120V outlet open? If so, reset the circuit breaker.
Is the thermostat dial turned to an operational position (not OFF)? If not, start with a setting of 3½ and turn to the setting you want. If the thermostat still does not start the refrigerator, check the thermostat for continuity: turn the dial fully counter-clockwise and check resistance between the two electrical connectors of the thermostat. It should be an open circuit. Turn the dial clockwise until you hear the click of the contacts inside. From this point on, resistance between the connectors should be approximately zero Ohms. If the thermostat checks out bad, see par. 3-11 for replacement procedure.
If the system still does not start, with a new thermostat if the old one failed the continuity test, substitute a new PTC starter relay. Follow par. 3-7 through step f3. Then remove the piggy-back connectors from relay P8 and P2, pull the relay off the pins holding it to the compressor at J5, J6, and J7. Install a new relay onto the compressor plug and reverse the procedure to connect the system for running.
If the compressor and fan motor still do not run, return the refrigerator to depot for repair or replacement.

Symptom: **Refrigerator operates, but does not cool.**
Remedy: Has the refrigerator been turned on for at least an hour?
Is the thermostat set to a low enough temperature? If not, try a lower setting.
If the refrigerator still does not cool, open the door and touch the cold plate (evaporator). If the cold plate has frost and is cold to the touch, see par. 3-11, for replacing the thermostat.
If the cold plate is warm, return the refrigerator to depot for further checks and/or replacement.

Symptom: **Articles in the refrigerator and/or freezer section are too warm.**
Remedy: Has the refrigerator been turned on for at least an hour?
Is the thermostat set to a low enough temperature? If not, try a higher setting.
If the refrigerator still does not cool, open the door and touch the cold plate (evaporator). If the cold plate has frost and is cold to the touch, see par. 3-11, for replacing the thermostat.
If the cold plate is warm, return the refrigerator to depot for further checks and/or replacement.

Symptom: **Articles in the refrigerator and/or freezer section are too cold.**
Remedy: Has the refrigerator been on for at least an hour?
Is the thermostat setting too high? If so, turn the dial to a lower setting, and let the refrigerator run for at least two hours to check temperature. If it is still too cold, reduce setting to a lower number.
If changing the thermostat setting does not warm the refrigerator, see par. 3-11, for replacement of the thermostat.

220 VOLT (60/50 Hz) POWER GRID SYSTEM

Symptom: **Refrigerator does not cool or operate.**
Remedy: Is the 220V electrical plug in a 220 VAC outlet? If not, plug it in.
Is the 120V electrical plug connected to the 120 VAC outlet on the transformer?
Is the circuit breaker for the 220 V outlet open? If so, reset it.
Is the thermostat dial turned to an operational position (not OFF)? If not, start with a setting of 3½ and turn to the setting you want. If the thermostat still does not start the refrigerator, check the thermostat for continuity: turn the dial fully counter-clockwise and check resistance between the two electrical connectors of the thermostat. It should be an open circuit. Turn the dial clockwise until you hear the click of the contacts inside.

From this point on, resistance between the connectors should be approximately zero Ohms. If the thermostat checks out bad, see par. 3-11 for replacement procedure.

If the system still does not start, with a new thermostat if the old one failed the continuity test, substitute a new PTC starter relay. Follow par. 3-7 through step f3. Then remove the piggy-back connectors from Relay P8 and P2, pull the relay off the pins holding it to the compressor at J5, J6, and J7. Install a new relay onto the compressor plug and reverse the procedure to connect the system for running.

If the compressor and fan motor still do not run, return the refrigerator to depot for repair or replacement.

Symptom: **Refrigerator operates, but does not cool.**

Remedy: Has the refrigerator been turned on for at least an hour?

Is the thermostat set to a low enough temperature? If not, try a lower setting.

If the refrigerator still does not cool, open the door and touch the cold plate (evaporator). If the cold plate has frost and is cold to the touch, see par. 3-11 for replacing the thermostat.

If the cold plate is warm, return the refrigerator to depot for further checks and/or replacement.

Symptom: **Articles in the refrigerator and/or freezer section are too warm.**

Remedy: Has the refrigerator been turned on for at least an hour?

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If the refrigerator still does not cool, open the door and touch the cold plate (evaporator). If the cold plate has frost and is cold to the touch, see par. 3-11, for replacing the thermostat.

If the cold plate is warm, return the refrigerator to depot for further checks and/or replacement.

Symptom: **Articles in the refrigerator and/or freezer section are too cold.**

Remedy: Has the refrigerator been turned on for at least an hour?

Is the thermostat setting too high? If so, turn the dial to a lower setting, and let the refrigerator run for at least two hours to check temperature. If it is still too cold, reduce setting to a lower number.

If changing the thermostat setting does not warm the refrigerator, see par. 3-11, for replacement of the thermostat.

3-6. **Corrective Maintenance Procedures.**

CAUTION

Before performing any of the following, be sure that the refrigerator is unplugged from its power source.

The following are detailed procedures for replacement of specific functional components of the Marvel 61RF Refrigerator, NSN 4110-01-291-7046. Before beginning work, you should have on hand, at a minimum, the tools recommended in the list at par. 1-9, and the specified replacement part for the refrigerator. Each separate procedure below tells you what replacement parts to have on hand, how to remove the defective parts, then install the replacements.

3-7. **Fan Assembly Replacement** (Service Assembly 42241277).

a. Position the refrigerator for easy access to front and back.

b. Using the 3''-4'' phillips screwdriver, remove the mounting screws from the cabinet back, and remove the back. Put the back and the screws (12) aside for later re-assembly. Recessed into the foam insulation, both the large copper suction return line from the evaporator and the thin capillary tube carrying cold liquid from the filter/dryer to the evaporator run up to the upper left corner. Under these lines is the thin aluminum capillary tube/sensor line from the thermostat.

c. Using the 3''-4'' phillips screwdriver, remove the stainless steel backshield then set the screws (5) and the backshield aside for re-assembly later.

CAUTION
THE 32-LB MECHANICAL ASSEMBLY IS STILL FULLY ATTACHED TO THE REFRIGERATION SYSTEM.
YOU CAN MOVE THE ASSEMBLY ONLY A FEW INCHES OUT OF THE COMPARTMENT WITHOUT DANGER OF DAMAGING THE COPPER REFRIGERANT LINES.
BE SURE THAT YOUR WORK SURFACE IS WIDE ENOUGH TO SUPPORT THE MECHANICAL ASSEMBLY WHEN YOU HAVE IT PULLED ABOUT 4-6 INCHES BACK FROM ITS OPERATIONAL POSITION, AND ROTATED A FEW DEGREES HORIZONTALLY.

d. Refer to fig. 3-1, Refrigerator Mechanical Assembly. The mechanical assembly is comprised of all the components mounted on the steel baseplate at the lower rear of the refrigerator, fig. 3-1, No. 14. Dismount the mechanical assembly by removing the four screws, fig. 3-1, No. 8. Three screws hold the baseplate to the refrigerator cabinet's reinforcement bar, and the fourth screw is also the upper fan motor assembly support screw. Set the screws aside for later use.

e. Remove the cabinet ground screw at fig. 3-1, No. 13, or loosen it so that it does not make contact with the refrigerator cabinet frame. This makes it much easier to slide the mechanical assembly back from it's operational position.

f. Fig. 3-1, No. 15, is the plastic cover for the compressor's electrical terminal and starter. Remove the cover as follows:

1. Remove the U-shaped retaining clamp holding the cover onto its support by prying the clamp back and away from its seated position.
2. Remove the plastic cover by pulling it out and away.
3. Set both clamp and cover aside for re-assembly later.

g. Locate the wire leads from the fan motor and follow them back to the "piggy-back" spade-lug connectors on the terminal/starter. By gently, steadily pulling on the spade connectors, remove them from the piggy-back lugs, and set the motor leads aside.

h. Push the piggy-backs firmly back onto the starter terminals so that they are firmly engaged onto the starter terminals (fig. 2-1, P8 and P2). Also, push the starter firmly into its 3-pin terminal connection against the side of the compressor. Either motor lead can go to either P8 or P2.

i. Use the 8" phillips screwdriver to loosen and remove the two screws fastening the bottom of the fan motor bracket to the baseplate. Set the screws aside for later re-assembly. Carefully pull the fan assembly up and away from the fan guard, toward the compressor, and lift it clear. Discard the old fan assembly.

j. Assembly is the reverse of the above procedure.

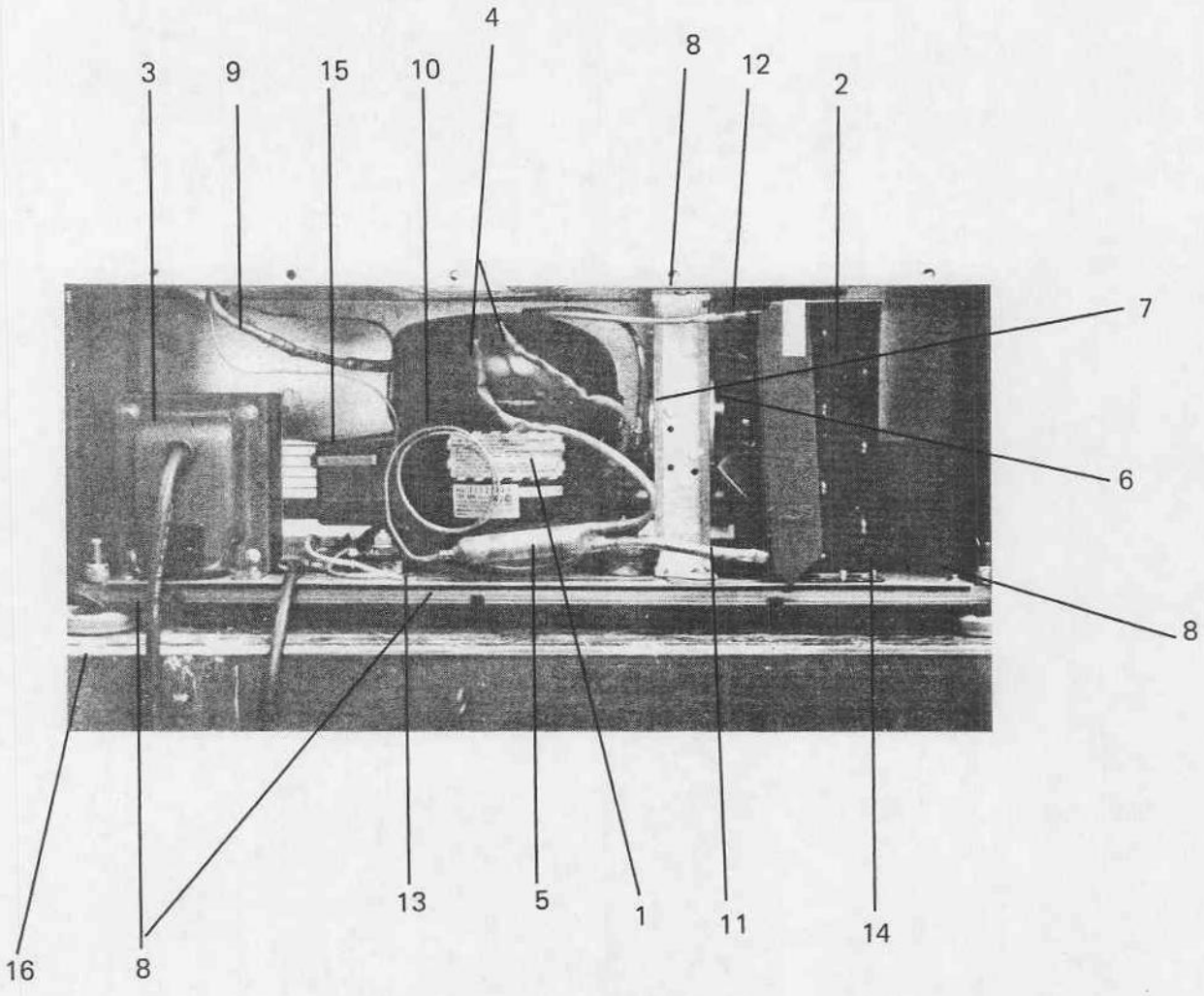

Fig. 3-1. Refrigerator Mechanical Assembly

1. Compressor
2. Condenser
3. Transformer
4. Fill lines
5. Filter/dryer
6. Fan motor
7. Fan motor support
8. Mechanical assembly mounting screws
9. Return from evaporator
10. Cold line to evaporator
11. Condenser output to filter/dryer
12. Condenser input from compressor
13. Cabinet ground
14. Baseplate
15. Starter relay cover
16. Glide

3-8. **Transformer/Power Cord Replacement** (Service Assembly 42241278)

NOTE

IF THE TRANSFORMER POWER CORD MUST BE REPLACED, USE THE SAME PROCEDURE AS FOR THE TRANSFORMER: THE CORD IS PERMANENTLY ATTACHED TO THE TRANSFORMER

a. Position the refrigerator for easy access to front and back.

b. Using the 3"-4" phillips screwdriver, remove the stainless steel backshield then set the screws (5) and the backshield aside for re-assembly later.

CAUTION

THE 32-LB MECHANICAL ASSEMBLY IS STILL FULLY ATTACHED TO THE REFRIGERATION SYSTEM.

YOU CAN MOVE THE ASSEMBLY ONLY A FEW INCHES OUT OF THE COMPARTMENT WITHOUT DANGER OF DAMAGING THE COPPER REFRIGERANT LINES.

BE SURE THAT YOUR WORK SURFACE IS WIDE ENOUGH TO SUPPORT THE MECHANICAL ASSEMBLY WHEN YOU HAVE IT PULLED ABOUT 4-6 INCHES BACK FROM ITS OPERATIONAL POSITION, AND ROTATED A FEW DEGREES HORIZONTALLY.

c. Refer to fig. 3-1, Refrigerator Mechanical Assembly. The mechanical assembly is comprised of all the components mounted on the steel baseplate at the lower rear of the refrigerator, fig. 3-1, No. 14. Dismount the mechanical assembly by removing the four screws, fig. 3-1, No. 8. Three screws hold the baseplate to the refrigerator cabinet's reinforcement bar, and the fourth screw is also the upper fan motor assembly support screw. Set the screws aside for later use.

d. Remove the cabinet ground screw at fig. 3-1, No. 13, or loosen it so that it does not make contact with the refrigerator cabinet frame. This makes it much easier to slide the mechanical assembly back from it's operational position.

e. Using the 8" phillips screwdriver, loosen and remove the two screws securing the transformer to the baseplate (behind the transformer). This detaches the transformer from the mechanical baseplate. Set the screws aside for later re-assembly.

f. Pull out and away from the stainless steel backshield the rubber grommet through which the transformer power cord passes, and set the grommet aside for re-assembly.

g. Slide the transformer power cord through the hole in the shield.

h. Discard the old transformer.

i. Re-assembly is the reverse of the above procedure.

3-9. **120V Power Cord/Plug Replacement** (Service Assembly 42241279)

a. Position the refrigerator for easy access to front and back.

b. Using the 3"-4" phillips screwdriver, remove the mounting screws from the cabinet back, and remove the back. Put the back and the screws (12) aside for later re-assembly. Recessed into the foam insulation, both the large copper suction return line from the evaporator and the thin capillary tube carrying cold liquid from the filter/dryer to the evaporator run up to the upper left corner. Under these lines is the thin aluminum capillary tube/sensor line from the thermostat.

c. Using the 3"-4" phillips screwdriver, remove the stainless steel backshield then set the screws (5) and the backshield aside for re-assembly later.

CAUTION

THE 32-LB. MECHANICAL ASSEMBLY IS STILL FULLY ATTACHED TO THE REFRIGERATION SYSTEM.

YOU CAN MOVE THE ASSEMBLY ONLY A FEW INCHES OUT OF THE COMPARTMENT WITHOUT DANGER OF DAMAGING THE COPPER REFRIGERANT LINES.

BE SURE THAT YOUR WORK SURFACE IS WIDE ENOUGH TO SUPPORT THE MECHANICAL ASSEMBLY WHEN YOU HAVE IT PULLED ABOUT 4-6 INCHES BACK FROM ITS OPERATIONAL POSITION, AND ROTATED A FEW DEGREES HORIZONTALLY.

d. Refer to fig. 3-1, Refrigerator Mechanical Assembly. The mechanical assembly is comprised of all the components mounted on the steel baseplate at the lower rear of the refrigerator, fig. 3-1, No. 14. Dismount the mechanical assembly by removing the four screws, fig. 3-1, No. 8. Three screws hold the baseplate to the refrigerator cabinet's reinforcement bar, and the fourth screw is also the upper fan motor assembly support screw. Set the screws aside for later use.

e. Remove the cabinet ground screw at fig. 3-1, No. 13, or loosen it so that it does not make contact with the refrigerator cabinet frame. This makes it much easier to slide the mechanical assembly back from its operational position.

f. Fig. 3-1, No. 15, is the plastic cover for the compressor's electrical terminal and starter. Remove the cover as follows:

1. Remove the U-shaped retaining clamp holding the cover onto its support by prying the clamp back and away from its seated position.

2. Remove the plastic cover by pulling it out and away.

3. Set both clamp and cover aside for re-assembly later.

g. Remove the power cord white lead from the piggy-back connector on PTC starter relay, P2.

h. Loosen and remove the power cord green line from the cabinet ground screw, fig. 3-1, No. 13.

i. In front, below the door, dismount the plastic grill, by loosening the two phillips screws and removing them. Put the grill and screws aside for later re-assembly.

j. The thermostat is located behind the left corner of the grill. It attaches to the 120V power cord with two spade-lug connectors. Reach behind the thermostat and gently pull the two connectors off by pulling them straight to the rear. DO NOT pull directly on the wires. When the wire/connectors are free of the thermostat body, let them fall free.

k. At the mechanical assembly, use the 8" phillips screwdriver to remove the screw from the green clamp that secures the power cord, just to the right of the transformer. Set the clamp and screw aside for later re-assembly. Notice the location of the clamp on the power cord, and be sure that you replace it at the same location.

l. Now, release the thermostat wire and connectors from the white plastic support clamp under the front cabinet support pan and carefully pull the 120 Volt power cord thermostat wires/connectors toward the rear of the refrigerator. If the clamp pulls away from the support pan, use the new clamp and adhesive in the kit when you re-install the new power cord.

m. Be sure to note the routing pattern of the complete 120 Volt harness, then carefully remove the harness from the refrigerator, by pulling the cord out and away from the rear of the stainless steel backshield through the rubber grommet in the motor guard. Discard the old power harness.

n. Assembly is the reverse of the above procedure.

3-10. **Door Gasket Replacement** (Service Assembly 42241280)

a. Special equipment needed
Hand roller; 36-inch square cardboard sheet; 36-inch square table/bench.
NOTE: The gasket is non-adhesive.

b. Place the cardboard on the table to protect the refrigerator door during gasket replacement.

CAUTION

BE SURE TO SUPPORT THE DOOR DURING THIS PROCEDURE, TO PREVENT DAMAGE TO THE DOOR OR INJURY.

c. Remove the hinge-pin from the upper door hinge by using the small phillips screwdriver to loosen the hinge pin, then carefully lift the refrigerator door and place it front-down on the cardboard surface.

d. Set the hinge pin aside for later re-assembly.

e. To remove the old gasket, start at one corner of the door, using your hands only, steadily pull the arrowhead-shaped retainer cross-section from the aluminum, door-channel. When you have completely removed the gasket, discard it.

f. To install the replacement gasket, start at one corner of aluminum door channel, and press the corresponding corner of the new gasket retaining arrowhead into the channel with sufficient force to seat the shoulders of the arrowhead into the channel.

g. When the corner is fully engaged, use the hand roller to roll/push the remainder of the new door gasket into the retaining channel.

h. Inspect the installed door gasket to insure that the entire length is seated in the retainer channel, and that the gasket is undamaged. Adjust as necessary.

i. Re-assembly is the reverse of the procedure 3-10a-e, above.

3-11. **Thermostat Replacement** (Service Assembly 42240589).

a. Position the refrigerator to allow easy access to both front and back.

b. Remove the plastic grill in front, below the door, by using a phillips screwdriver to withdraw the two retainer screws. Put the grill and screws aside for later re-assembly.

c. Loosen and remove the two phillips screws holding the thermostat in place. Discard the screws (use screws from the service kit for re-assembly), pull the molded electrical connectors away from the thermostat body, and pull the green ground wire free of the thermostat. Let the old thermostat body hang free. It is now suspended from its aluminum capillary sensor tube, which runs back to the right lower corner, then up to the evaporator/freezer section, with the refrigerant copper lines.

d. At the rear, remove the cabinet back, using the phillips screwdriver to remove the mounting screws. Take the back off, and set the screws (12) aside for later re-assembly.

CAUTION

THE 32-LB. MECHANICAL ASSEMBLY IS STILL FULLY ATTACHED TO THE REFRIGERATION SYSTEM.
YOU CAN MOVE THE ASSEMBLY ONLY A FEW INCHES OUT OF THE COMPARTMENT WITHOUT DANGER OF DAMAGING THE COPPER REFRIGERANT LINES.
BE SURE THAT YOUR WORK SURFACE IS WIDE ENOUGH TO SUPPORT THE MECHANICAL ASSEMBLY WHEN YOU HAVE IT PULLED 4-6 INCHES BACK FROM ITS OPERATIONAL POSITION, AND ROTATED A FEW DEGREES HORIZONTALLY.

e. Remove the stainless steel backshield by removing the five phillips screws holding the backshield in place. Put the shield and screws (5) aside for later re-assembly.

f. Open the refrigerator door, remove the drip tray, and set it aside for later re-assembly.

g. With a phillips screwdriver, dismount the freezer door by removing the left and right shoulder screws, with springs, and left and right hinge mounting screws. Set the screws aside for re-assembly later. Now remove the three phillips screws attaching the evaporator plate to the ceiling of the freezer compartment. This allows the refrigerator's cold plate (evaporator) to hang free by the refrigerant line copper tubing harness.

h. The thermostat sensing thermobulb is the looped end of the capillary tube, clamped to a plate that is mounted on the right rear side evaporator, attached by the phillips screw at that location. Remove the screw holding the thermobulb clamp in place, then set the clamp and screw aside for later re-assembly -- if they are undamaged. If they are damaged, use parts from the service kit for re-assembly.

i. The thermostat thermobulb loop is now accessible behind the cold plate. Reach up and behind the cold plate (evaporator), grasp the thermobulb, and pull it away and downward, straightening the loop in the tube in the process.

j. Go to the rear of the refrigerator, and remove the thermostat's thermobulb tubing from the cabinet interior by pulling the tubing out and away from the exposed back of the refrigerator. (There will probably be two sections of refrigerator putty applied around the tubing at the top and bottom of the refrigerator back. Remove this putty, and replace the putty during re-assembly, to maintain insulation.) When the tubing is clear of the cabinet, let it hang free.

k. Remove the thermostat body and its attached tubing by pulling the thermostat body out and away from the front of the cabinet. Be sure that the thermostat tubing is straight, and does not catch or hang up on any refrigerator parts as it is pulled free. Discard the old thermostat and it's tubing.

l. Re-assembly is the reverse of the above procedure. Be sure to do the following:

1. When routing the thermostat tubing back to the evaporator be sure that there are no kinks, that all bends are smooth, that the tubing does not rest on the condenser, fan assembly, transformer, or compressor.

2. When removing the old thermostat and tubing, notice the method of routing the tubing, and use it as a guideline for routing the new thermostat and tubing.

3. Also, re-seal with refrigerator putty and protect all openings and cut-outs in the refrigerator.

4. For ease of installation with the thermostat thermobulb clamp, form the end of the thermostat tubing into a J-shaped loop about 3 to 4 inches long by 3/8 inch to 1/2 inch wide, no wider than the clamp. This provides the best contact between the sensor area and the evaporator shell, to give the most accurate temperature feedback to the thermostat.

3-12. **Front Glide Replacement** (Service Assembly 42241281).

CAUTION

Be sure that the refrigerator is empty, and that you have it supported at all times

a. Position the refrigerator to allow easy access to front and back, and on a work surface that allows you to place the refrigerator with either the front or back end projecting about six inches beyond the edge. This provides access to the glides.

b. For the front glides, remove the plastic front grill under the door, by using the small phillips screwdriver to remove the two screws retaining the grill. Set the parts aside for later re-assembly. Carefully supporting the refrigerator, push it forward so that the front glides project about six inches beyond the edge.

c. Use the combination wrench to break loose and turn the nut securing each front glide's threaded shaft, while applying the channel-lock pliers to the glide's foot to prevent rotation. When each nut is sufficiently loose, simply spin it off, using the other hand to fix the glide's foot.

d. Discard the old/damaged glides, but set the nuts aside for later re-assembly.

e. Assembly is the reverse of the above procedures.

3-13. **Rear Glide Replacement** (Service Assembly 42241281).

a. Use the 3" - 4" phillips screwdriver to remove the mounting screws from the cabinet back. Set the back and the screws (12) aside for later re-assembly.

b. Remove the metal motor guard by pulling the motor guard out and away from the cabinet. Set the guard aside for later re-assembly.

CAUTION
THE 32-LB. MECHANICAL ASSEMBLY IS STILL FULLY ATTACHED TO THE REFRIGERATION SYSTEM.
YOU CAN MOVE THE ASSEMBLY ONLY A FEW INCHES OUT OF THE COMPARTMENT WITHOUT DANGER OF DAMAGING THE COPPER REFRIGERANT LINES.
BE SURE THAT YOUR WORK SURFACE IS WIDE ENOUGH TO SUPPORT THE MECHANICAL ASSEMBLY WHEN YOU HAVE IT PULLED ABOUT 4-6 INCHES BACK FROM ITS OPERATIONAL POSITION, AND ROTATED A FEW DEGREES HORIZONTALLY.

c. Using a phillips screwdriver, loosen and remove the three screws securing the mechanical assembly baseplate to the bottom of the refrigerator, the upper fan motor support bracket screw then set the screws (4) aside for later re-assembly. Now loosen the cabinet ground screw (fig. 3-1, No. 13) so that it clears the bottom of the refrigerator compartment. This makes it easier to move the mechanical assembly baseplate.

d. Use the large phillips screwdriver to loosen and remove from the backside of the transformer the two remaining screws. Set the screws aside for later re-assembly. You can now push the transformer/power cord forward and away from the left rear glide nut assembly.

CAUTION
Be sure that the refrigerator is empty, and that you have it supported at all times.

e. Move the refrigerator so that the rear glides project over the end of the work surface about six inches.

f. Use the combination wrench to break loose and turn the nut securing each front glide's threaded shaft, while applying the channel-lock pliers to the glide's foot to prevent rotation. When each nut is sufficiently loose, simply spin it off, using the other hand to fix the glide's foot.

g. Discard the old/damaged glides, but set the nuts aside for later re-assembly.

h. Assembly is the reverse of the above procedures.

3-14. **Freezer Door Replacement** (Service Assembly 42240576)

a. Open the refrigerator door.

b. Use a phillips screwdriver to loosen and remove the left and right shoulder screws with springs, and the left and right hinge mounting screws. Notice how the springs are positioned.

c. If the screws are damaged, discard them, and use screws from the service assembly kit for re-assembly. If not, use the old screws.

d. Discard the old freezer door.

e. Re-assembly is the reverse of the above procedure.

3-15. For the assemblies listed below, DO NOT attempt repair below depot level. Send the entire refrigerator to the authorized depot level agency for repair or replacement.

* Compressor
* Condenser
* Cold Plate (evaporator)
  (The evaporator encloses the upper part of the freezer compartment)
* Refrigerant copper tubing
* Refrigerator cabinet and/or the hinged cabinet handles.

3-16. **Defrosting.**

To defrost the refrigerator:

a. Place all perishables from the freezer/refrigerator to another refrigerator.
b. Turn the thermostat OFF.
c. Open the refrigerator door.
d. **CAUTION**

Do not use any sharp objects to remove ice from the evaporator or any other part of the refrigerator.

e. When defrosting is complete, take out and empty the drip tray, then wipe down the interior of the refrigerator.

f. Close the door, reset the thermostat, and wait for at least an hour before you replace commodities in the refrigerator.

CHAPTER 4

REPLACEMENT PARTS LIST

4-1. INTRODUCTION.

4-2. The parts list is in tabular form, with four columns: Reference designation, part number, description, and quantity.

a. Reference designation: the figure number, and call out number on that figure for parts shown in the manual. If there is no reference designation number, the part is not illustrated.

b. Part number: the Marvel Industries part number, or commodity code, if applicable.

c. Description: a brief functional description of the part, with dimensions, other part numbers, or other helpful information.

d. Quantity: the number required for system operation.

4-3. The part numbers are grouped as follows: Refrigerator (top assembly), the service assemblies required for normal operation and maintenance, and then separate parts. Where attaching parts are part of the assembly, they are preceded by (attaching parts), with a short dashed line and asterisk to indicate the end of the attaching parts for a given service assembly.

REFERENCE DESIGNATION NUMBER	PART NUMBER	DESCRIPTION	QUANTITY
4-1, No. 10	42041276	Refrigerator cabinet assembly	1
	41000008	Refrigerator putty (sealing compound)	1 lb.
4-1, No. 4	42240576	Freezer door service assembly	1
4-1, No. 4	42050077	Evaporator door assembly	1
		(attaching parts)	
	41000402	Spring, evaporator door, left	1
	41000403	Spring, evaporator door, right	1
	08204907	No. 10-32 x 3/4" shoulder screw	2
		---*---	
4-1, No. 7	42240586	Door service assembly	1
	42030460	Door assembly	1
		(attaching parts)	
4-1, No. 5	41001355	Hinge pin	2
	41001481	Standard hinge	1
	41001482	Standard hinge	1
		---*---	
4-1, No. 1	42240589	Thermostat service assembly	1
	41001519	Thermostat, standard	1
	41002094	Thermostat knob	1
	41001389	Wire harness, thermostat ground	1
		(attaching parts)	
	41001860	Thermostat clamp	1
	08204884	No. 10-32 x 1/2" screw	1
	08204886	No. 6-20 machine screw	1
	08205115	No. 10 ext. tooth lockwasher	1
		---*---	
	42241277	Fan service assembly	1
4-3, No. 6, 7	42181221	Fan assembly	1
		(attaching parts)	
	41003619	No. 10-32 screw	3
	08205134	Washer	2
		---*---	
	42241278	Transformer/power cord service assembly	1

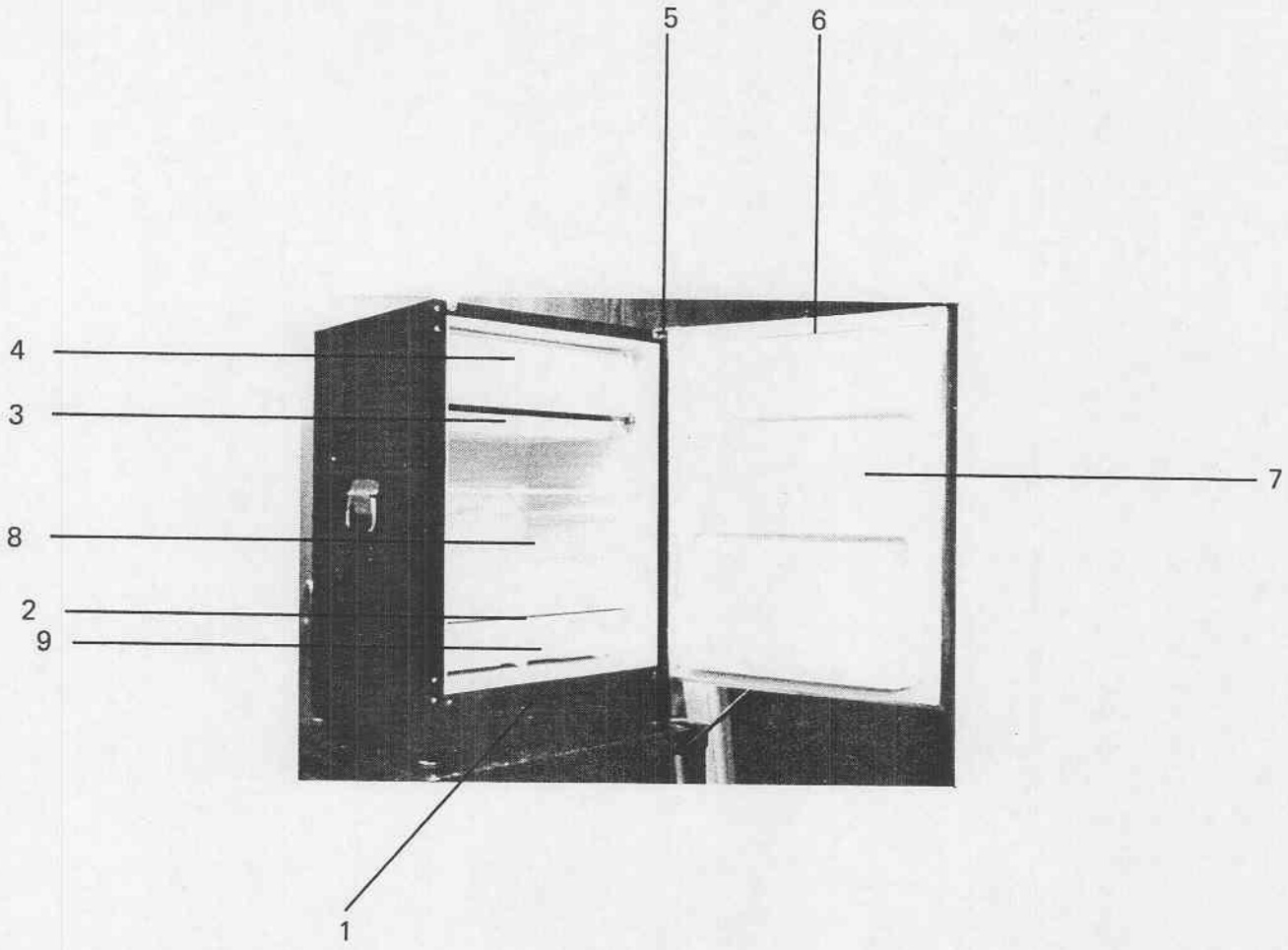

Fig. 4-1. Refrigerator, Front View

1. Thermostat (behind grill)
2. Crisper shelf
3. Drip tray
4. Freezer door
5. Hinge pin
6. Door gasket
7. Door
8. Wire shelf
9. Crisper tray
10. Cabinet assembly

4-3, No. 3	41003787	Transformer, 220V, w/power cord	1
		(attaching parts)	
	41003619	No. 10-32 x 1/4" machine screw	2
		---*---	
	42241279	120 Volt power cord service assembly	1
4-2, No. 3	41003795	Power cord, 120 Volt, U.S. Government	1
		(attaching parts)	
	08204884	No. 10-32, screw, type F	1
	41003685	Clamp, with adhesive (leads to thermostat)	1
	41001446	120 Volt power cord restraint (clamp)	1
	08204884	No. 10-32 self-tapping screw	1
		---*---	
4-1, No. 4	442241280	Door gasket service assembly	1
	41001220	6.1 Door gasket	1
	42220780	Carton assembly	1
	42241281	Glide service assembly	1
4-3, No. 16	41000850	Glides	4
		(attaching parts)	
	41000851	Nut	4
		---*---	
4-3	42081282	Mechancial assembly, U.S. Government, 220/110V	1
	08204877	Flat washer, 0.312 I.D.	2
	08204930	Pop rivet, aluminum, 1/8	2
	08205050	No. 1/4-20 carriage bolt	2
	08205051	No. 1/4-20 locknut	2
	41000180	Shroud clip, icemakers	1
	41001629	Copper tubing, 1/4 O.D. *6.25	1
	41002797	Grommet, rubber	4
	41002798	Sleeves, metal	2
4-3, No. 2	41003609	Condenser	1
	41003619	No. 10-32* 1/4 machine screw	5
	41003626	Fan shroud, HOT-1	1
	41003636	Tubing, HOT-1	1
4-3, No. 14	41003675	Baseplate, mechanical HOT-1	1
4-3, No. 3	41003787	Transformer/power cord	1
4-3, No. 1	41003791	Compressor	1
4-3, No. 5	42101240	Drier assembly	1
		(attaching parts)	
		---*---	
	42241283	Touch-up paint	1
	41000007	Ice cube tray	2
4-1, No. 3	41000407	Drip tray	1
4-1, No. 2	41000437	Crisper shelf, glass	1
4-1, No. 9	42210412	Crisper tray	1
4-1, No. 8	41000414	Wire shelf	2
4-1, No. 1	410001525	Lower front grill, plastic	1
		(attaching parts)	
	08205072	Screws	2
		---*---	
4-2, No. 4	41000396	Refrigerator cabinet back	1
		(attaching parts)	
	08204928	No. 10 x ½ sheet metal screw	12
		---*---	
4-2, No. 5	41001230	Stainless steel backshield	1
		(attaching parts)	
	08204884	No. 10-32 x ½, screw type F	5
		---*---	
4-3, No. 15	42241284	PTC starter service assembly	1
	41003503	Relay, PTC starter	1

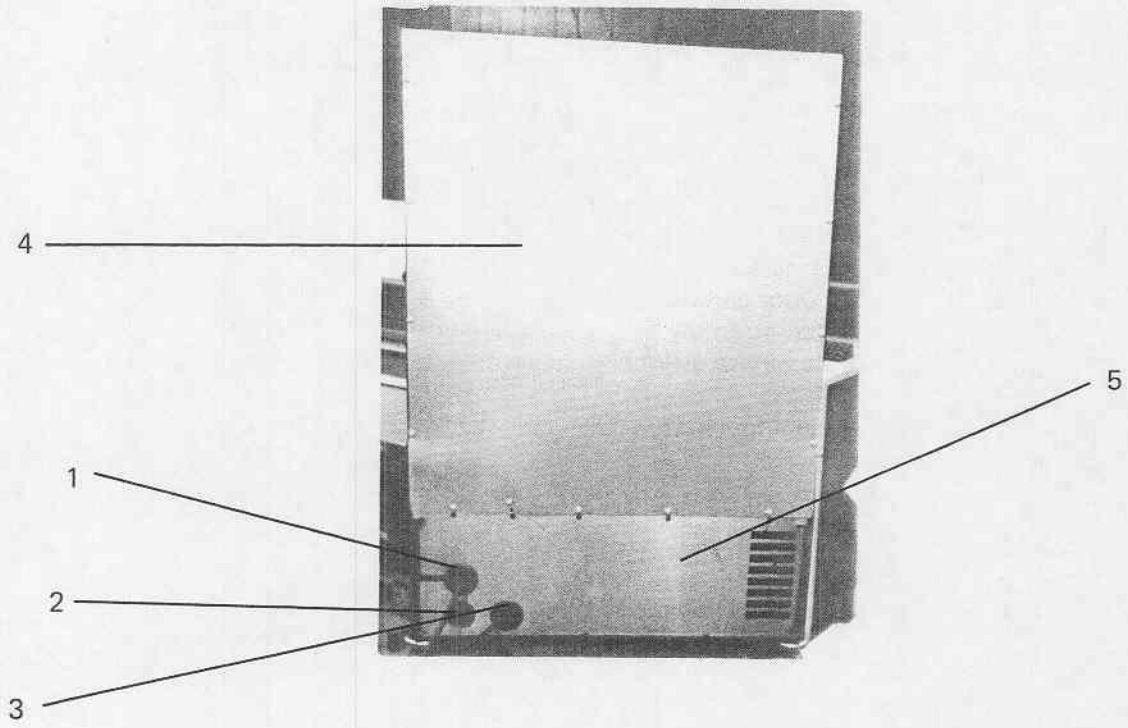

Fig. 4-2. Refrigerator, Rear View

1. Transformer 220 Volt line
2. Transformer 120 Volt outlet
3. 120 Volt power cord
4. Cabinet back cover
5. Stainless steel backshield (for mechanical assembly)

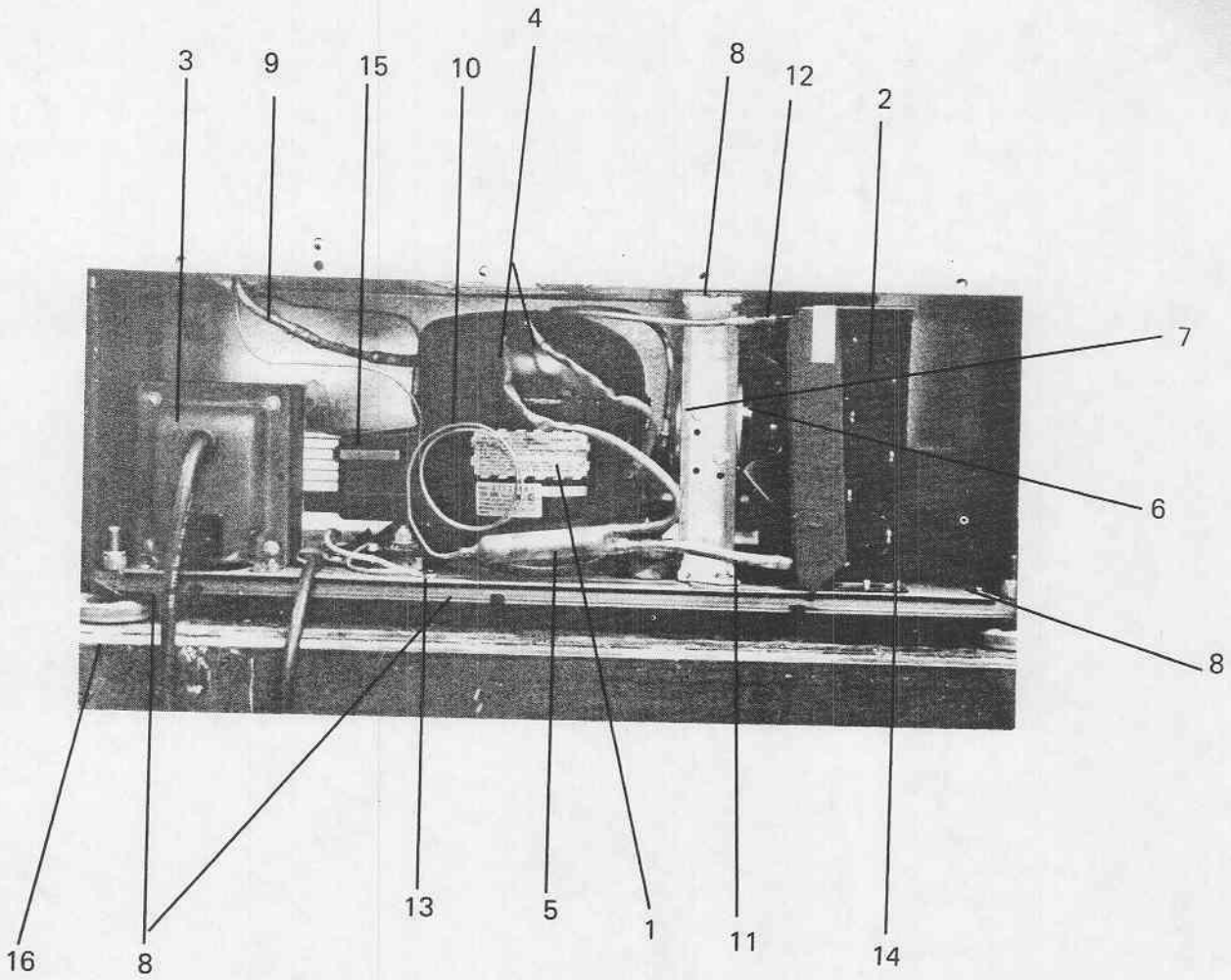

Fig. 4-3. Refrigerator Mechanical Assembly

1. Compressor
2. Condenser
3. Transformer
4. Fill lines
5. Filter/dryer
6. Fan motor
7. Fan motor support
8. Mechanical assembly mounting screws
9. Return from evaporator
10. Cold line to evaporator
11. Condenser output to filter/dryer
12. Condenser input from compressor
13. Cabinet ground
14. Baseplate
15. Starter relay cover
16. Glide

CHAPTER 5

DIAGRAMS

5-1. INTRODUCTION.

5-2. This chapter contains illustrations not located elsewhere in the test. Be sure to refer to the functional block diagram, fig. 2-1, for overall operation of the refrigerator.

5-3. The following illustrations are located here:
Fig. 5-1 Refrigerator wiring diagram.

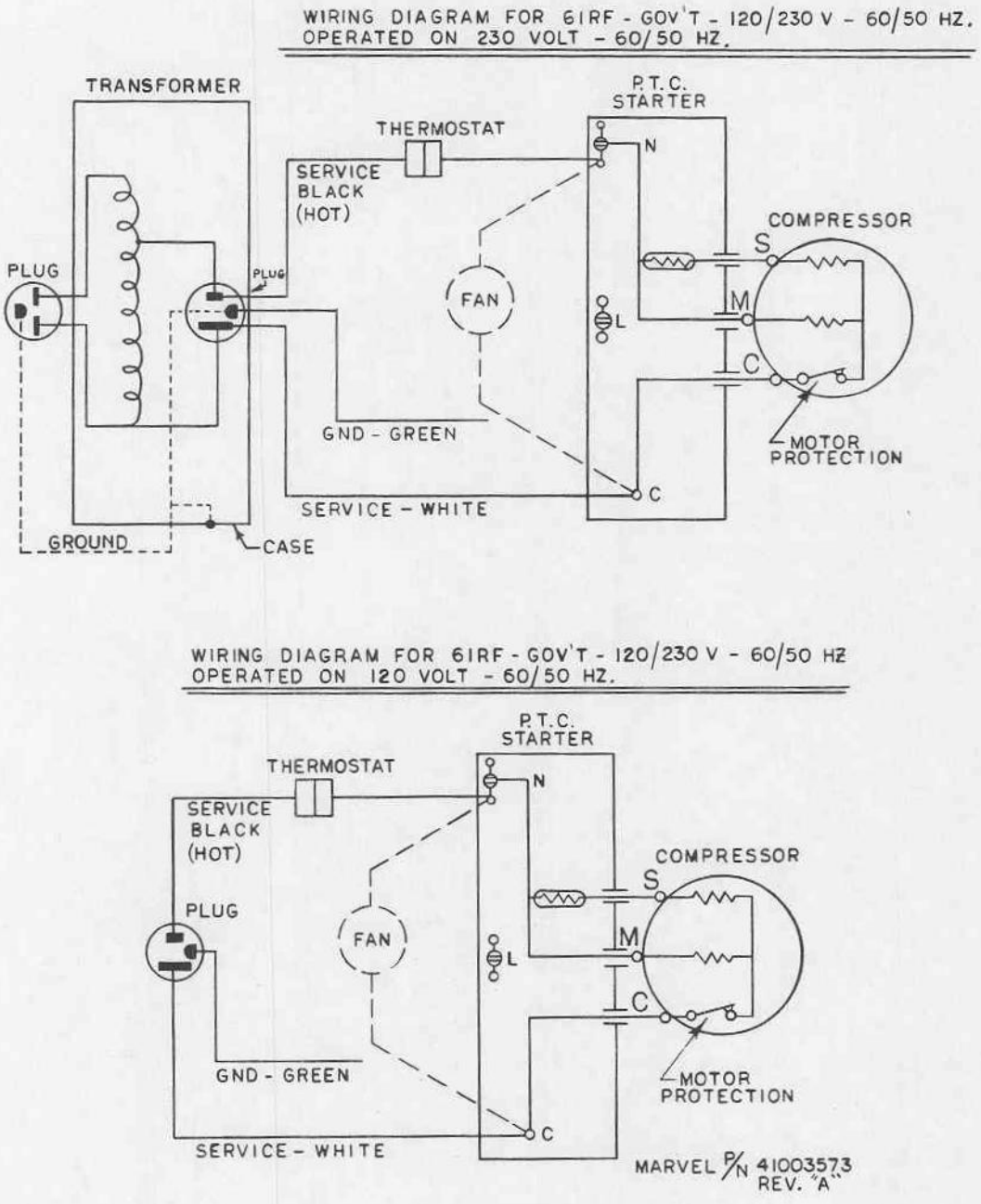

Fig. 5-1 Refrigerator wiring diagram